Psychometric properties of the parent's versions of the SDQ and the PANAS-X in a community sample of Portuguese parents

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Abstract

This study examined the psychometric properties of the parent's versions of the SDQ and the PANAS-X in a community sample of Portuguese parents. A total of 1,100 SDQ and PANAS-X were collected from an online sample of 761 parents, whose ages ranged from 23 to 65 years (M = 42, SD = 5). Confirmatory Factor Analyses provided evidence of the internal factor structure of both the SDQ and the PANAS-X and invariance of the factor structure across age and gender groups, with the exception of the SDQ, which failed to provide evidence of invariance between genders. Internal reliability and discriminant validity were confirmed for both measures, although convergent validity was only confirmed for the PANAS-X. Concurrent validity was also confirmed by comparing the results from the SDQ dimensions and the PANAS-X broad dimensions subscales.

Keywords: Child development; psychosocial adjustment; conduct problems; mood-related symptoms; screening measures.

Introduction

The Strengths and Difficulties Questionnaire (SDQ) is a widely used behavioral screening measure that covers different symptomatology in children and youth (Goodman, 1997). It is highly regarded for its sensitivity in detecting behavioral and emotional problems, and some studies have provided evidence of the screening accuracy of the SDQ in comparison to other well-established measures such as the Child Behavior CheckList (CBCL; Warnick, Bracken, & Kasl, 2008). The Positive and Negative Affect Schedule (PANAS) purports to assess positive and negative affect dimensions that characterize temperamental traits associated with anxiety and depression, and also can be used as part of a screening assessment of different anxiety and mood symptomology

(Watson, Clark, & Tellegen, 1988). Their brevity, ease of administration, and adaptation studies conducted in several countries and in different languages are among the strengths of both of these measures. However, there are few and sometimes contradictory findings regarding the internal structures of both measures (e.g., Goodman, Lamping, & Ploubidis, 2010).

The SDQ

The SDQ is a highly regarded screening measure of emotional and behavioral problems in children and youth (Goodman, 1997). It has been widely used in research as well as in child mental health practice due to its usefulness in identifying problematic behavior, emotional problems, and social difficulties at home and at school. There is both theoretical and empirical evidence of the existence of five dimensions namely Conduct Problems, Hyperactivity/Inattention, Emotional Symptoms, Peer Relationship Problems, and Prosocial Behaviors although the creator of the scale has later provided further evidence of three dimensions in which both conduct problems and hyperactivity/inattention comprise an Externalizing dimension, emotional symptoms, and peer relationships problems comprise an Internalizing dimension, while the third dimension consists of only positive, prosocial behaviors. The authors recommended that the five separate dimensions can be used for screening of mental health or behavioral problems while the three dimensions can be used for assessing rates of problems in low-risk community samples (Goodman et al., 2010).

The SDQ is available in over 80 languages and dialects and has three main versions – one for parents (children 2-4 years old or children 4-17 years old), one for teachers (children 2-4 years old or children 4-17 years old), and one self-report for children/adolescents (11-17 years old). However, in 2015 normative data was only

available in 10 countries, excluding Portugal (Youth in Mind, 2015). When compared to another well-established child mental health screening measures (e.g., the CBCL, Achenbach & Ruffle, 2000), the SDQ has shown to be highly reliable in discriminating between clinical and community samples. Some studies have found that the SDQ was at least as good as the CBCL in screening for emotional and behavioral problems, and some have reported that the few differences between the two measures seemed to favor the SDQ (Warnick et al., 2008).

There is little evidence of the psychometric properties of the SDQ with Portuguese samples. A search at the website "Youth in Mind" (www.sdqinfo.com), which collects information about studies using the SDQ worldwide, returned only one result for Portugal (Marzocchi et al., 2004), although a Portuguese translation is available on the website (Fleitlich, Loureiro, Fonseca, & Gaspar, 2005). The self-report Portuguese version of the SDQ has shown contradictory findings, with some studies reporting difficulties in confirming the 5-factor model of the scale and weak construct validity (Pechorro, Poiares, & Vieira, 2011). Other studies have confirmed the 5-factor structure in the three versions (self-report, teacher and parent) but have found some reliability issues and have failed to show evidence of its discriminant validity (Azevedo, Seabra-Santos, Gaspar, & Homem, 2013; Marzocchi et al., 2004).

The PANAS

The PANAS is a widely used screening measure for mood-related symptomatology, namely depression, and anxiety (Watson et al., 1988). Contrary to the SDQ it is not focused on behavioral symptomatology. Furthermore, it was initially developed with adults as a self-report measure but has since then evolved to be used with children and youth. In fact, it is now regarded as a useful screening measure for affective

problems in children (e.g., Lonigan, Phillips, & Hooe, 2003). The PANAS consists of 20 items divided into broad categories of Positive Affect and Negative Affect and asks respondents to recall the extent to which they felt each emotion during a specified period. Clark and Watson (1991) proposed that the PANAS scales measure both positive and negative affect which in differing proportions underlie both depression and anxiety. Clarke and Watson's tripartite model of anxiety and depression posited that people with depression and anxiety shared high negative affect, although people with depression would score low on positive affect while people with anxiety would score high on positive affect. Several studies have corroborated the tripartite model providing evidence of the correlation between PANAS scores and emotional and internalizing problems (Anthony, Lonigan, Hooe, & Phillips, 2002; Mikolajewski, Allan, Hart, Lonigan, & Taylor, 2013).

The PANAS has been used in various studies about affectivity and mood-related problems in Portugal, although little research has been devoted to investigate its psychometric properties and its validity as a screening measure. Furthermore, only the PANAS with the broad positive and negative affect dimensions has been studied in Portugal. Three psychometric studies have been published using Portuguese samples, and all three studies were conducted by the same research team (Galinha & Pais Ribeiro, 2005; Galinha, Pereira, & Esteves, 2013). Using the equivalent process to the original development studies conducted by Watson et al. (1988), the original 60 items were reduced to a final 20-item Portuguese version of the Positive Affect and Negative Affect (Galinha & Pais Ribeiro, 2005). In the final version, six out of the 10 items in the Positive Affect dimension were the same, and seven out of 10 in the Negative Affect dimension were the same. Further, both the internal consistency and inter-factor correlations were equivalent to the original version. Further studies corroborated the factorial stability of the PANAS and temporal invariance (Galinha et al., 2013). However, these studies were

conducted with adults, mostly using students or young adult samples. To our knowledge, the extended version of the PANAS has never been used for research in Portugal, or psychometrically assessed with children and adolescents.

The Present Study

Given the identified psychometric problems, the aim of this study was to provide a more complete picture of a child's socioemotional development through the combined use of two highly regarded measures of child's adjustment – The SDQ and the PANAS-X – that could be useful both in clinical and research work to assess both problematic and positive behavioral indicators and subjective well-being. Thus, we aimed to evaluate the psychometric properties of the parents' version of both the SDQ and the PANAS-X, and investigate the contribution of both measures together for a complete assessment of child psychosocial adjustment through the analyses of reliability, sensibility, construct and criterion validities in a community sample of Portuguese parents.

Materials and Methods

Participants and Procedures

The online survey was named "Parenting: Capabilities and Difficulties", and the study aims were described as exploring the strengths, difficulties, and challenges that Portuguese parents may face in raising their children, and how these may relate to the well-being of their children. A total of 1,100 completed questionnaires were collected, and from these, 18% were completed by fathers and 82% were completed by mothers. Parents' ages ranged from 23 to 65 (M = 42; SD = 5). Children's ages ranged from 6 to 18 years (M = 11, SD = 3), and gender groups were balanced. Parents were recruited through contacts with schools and parents' associations. Schools and parents'

associations were sent an email describing the study aims and instructions on how to participate in the study. Further information could be obtained by contacting the main researcher. The questionnaires were completed and hosted on an online survey platform. No compensation was offered to participants. Informed consent was obtained from all individual participants.

Measures

The Strengths and Difficulties Questionnaire. Parents were asked to complete the SDQ (Goodman, 1997). The SDQ is a brief behavioral screening measure, composed of 25 items divided into four difficulties subscales with 5 items each: Emotional Symptoms, Conduct Problems, Hyperactivity/Inattention, and Peer Relationship Problems, and one positive subscale: Prosocial Behavior. Items are measured on a 3-point Likert scale, from 0-*not true* to 2-*certainly true*. Higher scores on the four difficulties subscales reflect greater difficulties whereas higher scores on the positive subscale reflect greater prosocial behaviors, although no cut-off values on the SDQ are currently available in Portugal.

The Positive and Negative Affect Schedule. Parents were asked to complete the PANAS-X (Watson & Clark, 1994) regarding their children. PANAS-X is a 60-item adjective checklist designed to measure positive and negative affect. It includes 10 items for General Negative Affect and 10 items for General Positive Affect. Items are measured on a 5-point Likert scale, from 1-*very slightly or not at all* to 5-*extremely*. Given the lack of validation studies, we decided to test the original PANAS-X scales and asked parents to describe their children over the last few weeks. Higher scores on the negative affect subscale reflect greater negative affect whereas higher scores on the positive affect subscale reflect greater positive affect.

Data Analysis

The data were analyzed using the Predictive Analysis Software (PASW) Statistics version 21 and the Analysis of Moment Structures (AMOS) version 21. PASW was used to calculate descriptive statistics and correlations between variables. AMOS was used to conduct Confirmatory Factor Analyses (CFA) and Multi-Group Confirmatory Factor Analyses (MGCFA) of the SDQ and the PANAS-X. CFA models were evaluated with χ^2, and an alpha level of .05 was used to determine statistical significance, using Maximum Likelihood as estimator. There were no missing data on either measure. Model fit was assessed using the Chi-square test, the Comparative Fit Index (CFI), the Goodness of Fit Index (GFI), the Tucker Lewis Index (TLI), and the Root Mean Square Error of Approximation (RMSEA). Values above .90 on the CFI, the GFI, and the TLI, and below .08 on the RMSEA are indicators of an acceptable model fit. Values above .95 on the CFI, the GFI, and the TLI, and below .05 on the RMSEA are indicators of good model fit (Hair, Black, Babin, Anderson, & Tatham, 2006). Model invariance between groups (gender and age groups) regarding baseline model (i.e., unconstrained) and resulting model (Fixed Factor Loadings, Structural Means and Structural Covariances) was calculated using ΔCFI ($\leq .01$) (Byrne, 2010).

Results

Construct Validity of the SDQ

Factorial validity. Following the proposed factor structure of the SDQ, a Confirmatory Factor Analysis (CFA) was performed. Multivariate normality was confirmed for all but two items (items 12 and 22), which had both Skewness ($|Sk| > 3$) and Kurtosis ($|Ku| > 7$) problems (Table 1). However, in order to fully assess the construct

validity of the Portuguese version of the SDQ, these two items were not deleted. All factors were allowed to correlate. The first-order 5-factor model had an acceptable fit, χ^2 (263) = 1125.079, $p < .001$, CFI = .860, GFI = .920, TLI = .830, RMSEA = .055, 90% CI [.051, .058], AIC = 1249.079, BIC = 1559.269. All items significantly loaded onto their subscale. Internal consistency reliabilities (Cronbach's alpha) ranged from low to acceptable: α = .64 for Emotional symptoms; α = .56 for Conduct problems; α = .79 for Hyperactivity/Inattention; α = .60 for Peer relationship problems; and α = .70 for Prosocial behavior.

A second CFA was performed to assess the 3-factor model, consisting of Internalizing Problems (emotional symptoms & peer relationship problems), Externalizing Problems (conduct problems & hyperactivity/inattention), and Prosocial behavior. All factors were allowed to correlate. The first-order 3-factor model had an acceptable fit, χ^2 (265) = 1178.017, $p < .001$, CFI = .842, GFI = .919, TLI = .831, RMSEA = .056, 90% CI [.053, .059], AIC = 1298.017, BIC = 1598.201. All items significantly loaded onto their subscale. Internal consistency reliabilities (Cronbach's alpha) were all acceptable; Internalizing: α = .72, Externalizing: α = .79, Prosocial behavior: α = .70.

Overall, although model fit for the 3-factor solution and for the 5-factor solution were similar, we chose to report only the former solution for the remainder of the analysis as it has been suggested its better adequacy in assessing rates of problems in low-risk community samples (Goodman et al., 2010)[1]. The correlations among the subscales were all significant. The correlation between Internalizing and Externalizing was .379, the correlation between Prosocial behavior and Externalizing was -.328, and the correlation between Prosocial behavior and Internalizing was -.244 (all p's < .001).

[1] All the analyses were run for both the 3-factor and the 5-factor solution, but only the 3-factor solution will be reported here. Please contact the first author for information about further results for the 5-factor solution.

Invariance of the factor structure. Two multi-group factor analyses were performed to assess the invariance of the 3-factor model structure between gender groups (boys and girls) and age groups (6-10yrs and 11-18yrs). The criterion for dividing the age groups was based on the applications of the SDQ; normative data are available for these age groups and also for gender groups. Model fit statistics are shown in Table 1. Regarding the invariance for gender groups, when comparing the model with factor loadings constrained (Model 2b) with the unconstrained model (Model 2a), results confirmed the non-invariance of the factor loadings, ΔCFI = .002. When comparing the model with mean structure constrained (Model 2c) with the unconstrained model (Model 2a), results confirmed the invariance of structural mean, ΔCFI = .03. When comparing the model with structural covariances constrained (Model 2d) with the unconstrained model (Model 2a), results confirmed the invariance of the structural covariances, ΔCFI = .02. Regarding the invariance for age groups, when comparing the model with factor loadings constrained (Model 2b) with the unconstrained model (Model 2a), results confirmed the invariance of the factor loadings, ΔCFI = .004. When comparing the model with structural means constrained (Model 2c) with the unconstrained model (Model 2a), results confirmed the invariance of mean structure, ΔCFI = .03. When comparing the model with structural covariances constrained (Model 2d) with the unconstrained model (Model 2a), the results confirmed the invariance of the structural covariances, ΔCFI = .04.

[Table 1]

Reliability, and convergent and discriminant validities. To assess the reliability of each factor in the 3-factor model, all three-factor revealed acceptable reliability but low convergent validity. Discriminant validity was assessed by calculating

the square root of average extracted mean which must be higher than inter-factor correlations. Discriminant validity was confirmed for all comparisons (Table 2).

[Table 2]

Construct Validity of the PANAS-X

Factorial validity. Following the proposed factor structure of the PANAS-X, a Confirmatory Factor Analysis (CFA) was performed. Multivariate normality was confirmed for all but one item (item 31 "scared"), which had Skewness (|Sk| > 3) and Kurtosis (|Ku| > 7) problems. However, to fully assess the construct validity of the Portuguese version of the PANAS-X, this item was not deleted. Both factors were allowed to correlate. The first-order 2-factor model had an acceptable fit, χ^2 (158) = 828.137, p < .001, CFI = .911, GFI = .926, TLI = .893, RMSEA = .062, 90% CI [.058, .066]. All items significantly loaded onto their subscale. All items significantly loaded onto their subscale. Internal consistency reliabilities (Cronbach's alpha) were α = .857 for Positive Affect and α = .802 for Negative Affect. The correlation between the two broad dimensions (Positive and Negative Affect) in the 2-factor model was weak but significant, r = -.276, p < .001.

Invariance of the factor structure. Two multi-group factor analyses were performed to assess the invariance of the 2-factor model structure between genders (boys and girls) and age groups (6-10yrs and 11-18yrs). Model fit statistics are shown in Table 3. Regarding the invariance for gender groups, when comparing the model with factor loadings constrained (Model 2b) with the unconstrained model (Model 2a), results confirmed the invariance of the factor loadings, ΔCFI = .001. When comparing the model with mean structure constrained (Model 2c) with the unconstrained model (Model 2a), results confirmed the invariance of mean structure, ΔCFI = .003. When comparing the model with structural covariances constrained (Model 2d) with the unconstrained model

(Model 2a), results confirmed the invariance of structural covariances, ΔCFI = .003. Regarding the invariance for age groups, when comparing the model with factor loadings constrained (Model 2b) with the unconstrained model (Model 2a), results confirmed the invariance of the factor loadings, ΔCFI = .001. When comparing the model with structural means constrained (Model 2c) with the unconstrained model (Model 2a), results confirmed the invariance of mean structure, ΔCFI = .03. When comparing the model with structural covariances constrained (Model 2d) with the unconstrained model (Model 2a), the results, confirmed the invariance of structural covariances, ΔCFI = .03.

[Table 3]

Reliability, and convergent and discriminant validities. To assess the reliability of each factor of both the 2-factor and the 4-factor models, composite reliabilities were calculated. All factors had acceptable reliabilities (CR > .7) and convergent validities (AVE > .5). Discriminant validity was assessed by calculating the square root of average extracted mean, which must be higher than inter-factor correlations (Fornell & Larcker, 1981). Discriminant validity was confirmed for all but one comparison in the 4-factor model (Table 4).

[Table 4]

Criterion Validity

Concurrent validity. To assess the concurrent validity of the SDQ and its subscales with the PANAS-X and its subscales, bivariate correlations among the subscales were calculated (Table 5). Regarding the SDQ broad Internalizing and Externalizing and the PANAS-X general Positive and Negative Affect, moderate and high correlations were found, and particularly a correlation of .572 between Internalizing and Negative Affect. In addition, the SDQ Prosocial behaviors subscale had a moderate

positive correlation with Positive Affect and negative correlations with Negative Affect. In sum, concurrent validity between the SDQ and its subscales and the PANAS-X and its subscales were demonstrated.

[Table 5]

Discussion

The main aims of this study were to assess the psychometric properties and construct and criterion validities of the parents' version of the Strengths and Difficulties Questionnaire and the Positive and Negative Affect Schedule, and to examine the potential contribution of both measures together for a more complete assessment of child psychological adjustment that encompasses problematic as well as positive behavioral indicators. We will proceed with the discussion of the findings separately for each measure.

The SDQ

The findings regarding the psychometric properties of the SDQ were generally positive. The 3-factor structure, which is often used in research on child psychosocial adjustment outcomes showed acceptable internal consistencies for the three subscales. Likewise, both the 5-factor and the 3-factor structures of the SDQ were confirmed in Italian community samples by Di Riso et al. (2010) with the 3-factor model revealing a better fit to the data. However, the authors reported some low factor loadings on some items and generally low Cronbach's alphas. Another Italian study (Li, Delvecchio, Di Riso, Lis, & Salcuni, 2017) was able to confirm both the 5-factor and the 3-factor model with acceptable Cronbach's alphas, but the overall model fit was low with CFI fit indexes

below .90. One review of 48 studies assessing the psychometric properties of the parents and teachers' version of the SDQ highlighted divergent results across studies, with some replicating the 5-factor structure and others the 3-factor structure, and only a few able to replicate both structures (Stone, Otten, Engels, Vermulst, & Janssens, 2010).

The discriminant validity of the three subscales was confirmed by the analysis of the Portuguese SDQ scores. Thus, there was evidence that the SDQ items are good indicators of internalizing, externalizing, and prosocial behaviors, as well as of the validity of the measurement scales (Fornell & Larcker, 1981). Nonetheless, it should be also acknowledged that two items showed significant violations to multivariate normality; item 12 "Often fights with other children or bullies them", and item 22 "Often lies or cheats". It may have been the case that parents were not aware of their children problematic behaviors, such as fighting, or that these are not prevalent in low-risk community samples. We suggest that future studies should further investigate any problems in the normal distribution of these two items in both clinical and community samples. The convergent validity of the SDQ assessed through the average variance extracted (AVE) was generally low for each of the three subscales in contrast with the moderate composite reliabilities found. Other authors have suggested that the AVE is a very strict and conservative measure of convergent validity (Malhotra & Dash, 2011) and suggested that measurement of convergent validity can rely solely on adequate composite reliability. Nevertheless, we recommend further assessment of convergent validity of the SDQ 3-factor model.

The model invariance observed between age groups provided evidence of the construct validity of the SDQ for different ages, corroborating the validity of the SDQ to screen problem behaviors in a wide age range (from 6 years to 18 years old). However, our analyses indicated variations in the SDQ factor structure for boys and girls. This result

is consistent with other reported differences between boys and girls in SDQ scores (e.g., Marzocchi et al., 2004), with boys scoring higher than girls on Externalizing behaviors and girls scoring higher than boys on Internalizing behaviors. Nevertheless, the absence of model invariance raises some concerns over the construct validity of the SDQ subscales considering that the factor loading between the two groups significantly differed. Thus, future studies should further investigate whether gender differences could be observed in self-report SDQ and/or teacher's reports on the SDQ as there might be cultural differences in parental and youth perceptions of gender acceptable behavior.

The PANAS

Regarding the PANAS-X, the internal consistency of both negative and positive affect was high. Furthermore, both convergent and discriminant validities were observed. Model invariance was confirmed for both gender groups and age groups in the 2-factor model of the broad affect dimensions, which has been reported elsewhere for children's self-report scores (Lonigan, Hooe, David, & Kistner, 1999; Lonigan, Phillips, & Hooe, 2003). Nevertheless, to the best of our knowledge, this study was the first to use the PANAS-X to gather parental perspectives of children' affective traits. Our findings provided further evidence of the stability of the PANAS-X construct validity and factor structure. It is noteworthy that this stability was observed in a sample that until now has been underresearched. While some authors have been developing newer and shorter version of the PANAS, namely the PANAS-C (Laurent et al., 1999) and the PANAS-C-P (Ebesutani, Okamura, Higa-McMillan, & Chorpita, 2011), it is promising that the original PANAS-X might also be useful for children and youth because the scale already has been established with adults.

Implications and Directions for Future Research

Both the SDQ and the PANAS-X are well-established measures of child and youth psychosocial difficulties. Neither measure was intended to diagnose psychopathology per se, but each was conceived as a screening measure that would be sensitive to problematic behaviors or emotional difficulties. As such, both the SDQ and the PANAS-X perform well and are extremely useful in identifying early signs of problems for children and youth. Nevertheless, researchers need to be particularly aware of the cultural differences that may affect the internal structures of these measures, especially for the SDQ given the difficulties in confirming the invariance of its internal structure with respect to gender, and thus be mindful of the need to assess the psychometric properties of these measures before analyzing their data. A vital strength of both the SDQ and the PANAS-X is the assessment of positive competences and features that other child adjustment measures do not contemplate. In fact, focusing on strengths as well as on difficulties may also highlight positive child developmental areas that can be informative when developing intervention programs for at-risk children and youth, and crucially reinforce the positive competences already available to the young person.

Limitations

The current study was not without limitations. Regarding the sample in this study, the characteristics of the parents (i.e., highly educated, with medium-high income, and mostly mothers) and of the recruitment procedures (i.e., online and through convenience sampling) may have influenced the results from this study. To the extent to which the results could be generalized to the Portuguese population cannot be determined. Future studies should aim to recruit more diverse samples. Further, the present study only examined the factor structure, internal consistency, and concurrent validity of the parents'

version of the SDQ and the PANAS-X, and future studies should also evaluate test-retest reliability and predictive validity of these measures. Lastly, this study relied solely on parent's perspectives, and studies with teacher and child's perspectives are needed to further validate the results found in this study.

Conclusion

This study's findings provided further evidence of the construct and criterion validities of the SDQ and the PANAS from the parent's perspective. Although some shortcomings of the SDQ were identified, namely some factorial instability across genders and two problematic items, the scale showed an overall good fit to the data. Regarding the PANAS, the findings were mostly positive and a good fit to the data was also found. We documented evidence of adequate reliability, factorial, convergent and discriminant validities in a large sample of Portuguese parents. This evidence is compelling given, on the one hand, the scarcity of validation studies on these measures in different countries, and on the other hand, the need to develop reliable cross-cultural measures of children's behavioral and emotional adjustment and social competences. Normative data on the SDQ is available for only 10 countries whereas no normative data on the PANAS-X currently exists. Further efforts to develop norms and cut off scores to identify problematic behavior and emotional difficulties in children and youth are needed.

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Tables

Table 1

Goodness of fit statistics for the measurement models and factorial invariance for gender and age groups for the 3-factor model for the SDQ.

Description	Gender						
	χ^2	*df*	GFI	CFI	TLI	RMSEA	RMSEA 95% CI
2. Multiple-group model							
2a. Unconstrained	1069.609*	522	.871	.818	.809	.042	[.038, .045]
2b. FL	11141.277*	544	.864	.802	.789	.043	[.039, .046]
2c. FL + SM	1205.709*	569	.864	.789	.781	.043	[.040, .046]
2d. FL + SM + SC	1219.464*	575	.862	.796	.683	.043	[.040, .047]
2e. FL + SM + SC + MR	1575.104*	611	.831	.680	.679	.051	[.048, .054]

	Age groups						
	χ^2	*df*	GFI	CFI	TLI	RMSEA	RMSEA 95% CI
2. Multiple-group model							
2a. Unconstrained	1587.650*	534	.895	.817	.815	.042	[.040, .045]
2b. FL	1634.722*	556	.892	.813	.815	.042	[.040, .044]
2c. FL + SM	1832.371*	581	.890	.783	.813	.044	[.042, .047]
2d. FL + SM + SC	1859.099*	587	.809	.779	.806	.044	[.042, .047]
2e. FL + SM + SC + MR	2002.674*	617	.882	.759	.798	.045	[.043, .047]

Note: FL = Factor Loadings; SM = Structural Means; SC = Structural Covariances; MR = Measurement Residuals.
* $p < .001$.

Table 2
Reliability, convergent validity, and discriminant validity for the SDQ.

	3-factor model		
	R^2	CR	AVE
Internalizing (I)	.043	.716	.204
Externalizing (E)	.160	.772	.265
Prosocial Behaviors (P)	.076	.710	.337
	ρ^2 (Fij)	Discriminant Validity	
Internalizing (I) – Externalizing (E)	.144	< AVE I; < AVE E*	
Externalizing (E) – Prosocial Behaviors (P)	.108	< AVE E; < AVE P*	
Internalizing (I) – Prosocial Behaviors (P)	.060	< AVE I; < AVE P*	

Note: CR = Composite Reliability; AVE = Average Variance Extracted.
* Evidence of discriminant validity.

Table 3
Goodness of fit statistics for the measurement models and factorial invariance for gender and age groups for the 2-factor model for the PANAS-X.

Description	Gender						
	χ^2	*df*	GFI	CFI	TLI	RMSEA	RMSEA 90% CI
2. Multiple-group model							
2a. Unconstrained	733.029*	316	.871	.896	.875	.047	[.042, .051]
2b. FL	754.062*	334	.864	.895	.881	.046	[.041, .050]
2c. FL + SM	785.418*	354	.862	.893	.885	.045	[.041, .049]
2c. FL + SM + SC	786.748*	357	.862	.893	.886	.045	[.040, .049]
2d. FL + SM + SC + MR	846.435*	388	.831	.886	.888	.044	[.040, .048]

	Age groups						
	χ^2	*df*	GFI	CFI	TLI	RMSEA	RMSEA 90% CI
2. Multiple-group model							
2a. Unconstrained	979.166*	316	.916	.911	.898	.044	[.041, .047]
2b. FL	1006.508*	334	.913	.910	.897	.043	[.040, .046]
2c. FL + SM	1211.814*	354	.911	.885	.895	.047	[.044, .050]
2c. FL + SM + SC	1237.806*	357	.911	.882	.888	.047	[.045, .050]
2d. FL + SM + SC + MR	1302.333*	388	.904	.877	.888	.046	[.044, .049]

Note: FL = Factor Loadings; SM = Structural Means; SC = Structural Covariances; MR = Measurement Residuals.
* $p < .001$.

Table 4
Reliability, convergent validity, and discriminant validity for the PANAS-X.

	3-factor model		
	R^2	CR	AVE
Negative Affect (NA)	.342	.810	.307
Positive Affect (PA)	.631	.860	.391
	ρ^2 (Fij)	Discriminant Validity	
Negative Affect (NA) – Positive Affect (PA)	.076	< AVE NA; < AVE PA*	

Note: CR = Composite Reliability; AVE = Average Variance Extracted.
* Evidence of discriminant validity.

Table 5
Correlations among the SDQ and PANAS-X and its sub-scales.

	PANAS-X		
		Negative Affect	Positive Affect
SDQ	Externalizing	.472*	-.326*
	Internalizing	.572*	-.332*
	Prosocial Behaviors	-.201*	.327*

* $p < .001$.

Supplementary tables

Table 1

Standardized regression weights for the SDQ.

Subscale/Items	β	Range	*M* (*SD*)	|K|	|Sk|	α
Internalizing						.72
Item 3. Somatic	.361*	0-2	.35 (.58)	1.10	1.45	
Item 6. Solitary	.489*	0-2	.42 (.64)	.38	1.26	
Item 8. Worries	.443*	0-2	.54 (.67)	-.40	.87	
Item 11. Friendly [1]	.415*	0-2	.20 (.47)	4.64	2.31	
Item 13. Unhappy	.567*	0-2	.25 (.51)	2.74	1.89	
Item 14. Liked [1]	.474*	0-2	.19 (.42)	3.33	2.05	
Item 16. Nervous	.395*	0-2	.89 (.70)	-.94	.15	
Item 19. Bullied	.514*	0-2	.27 (.52)	2.49	1.84	
Item 23. Adult company	.377*	0-2	.47 (.63)	-.06	1.01	
Item 24. Fears	.444*	0-2	.47 (.64)	-.04	1.04	
Externalizing						.79
Item 2. Restless	.512*	0-2	.79 (.78)	-1.27	.39	
Item 5. Tempers	.464*	0-2	.62 (.70)	-.73	.67	
Item 7. Obedient [1]	.462*	0-2	.70 (.65)	-.73	.39	
Item 10. Fidgety	.539*	0-2	.52 (.72)	-.37	1.01	
Item 12. Fights	.395*	0-2	.08 (.31)	15.85	3.90	
Item 15. Distractable	.644*	0-2	.91 (.76)	-1.23	.15	
Item 18. Lies	.439*	0-2	.27 (.51)	2.34	1.80	
Item 21. Reflective [1]	.669*	0-2	.82 (.63)	-.55	.15	
Item 22. Steals	.227*	0-2	.03 (.22)	55.75	7.24	
Item 25. Persistent [1]	.638*	0-2	.72 (.67)	-.80	.40	
Prosocial behavior						.70
Item 1. Considerate	.598*	0-2	1.78 (.45)	2.66	-1.87	
Item 4. Shares	.433*	0-2	1.61 (.58)	.45	-1.20	
Item 9. Caring	.716*	0-2	1.70 (.52)	1.42	-1.53	
Item 17. Helpful	.423*	0-2	1.81 (.43)	4.14	-2.19	
Item 20. Kind	.668*	0-2	1.56 (.57)	-.29	-.850	

* $p < .001$

Note. [1] Reversed items.

Table 2

Standardized regression weights separately for gender and age groups for the 3-factor model for the SDQ.

	Gender		Age groups	
	Boys	Girls	6-10yrs	11-18yrs
Subscale/Items	β	β	β	β
Internalizing				
Item 3. Somatic	.388**	.408**	.363**	.391**
Item 6. Solitary	.455**	.344**	.338**	.560**
Item 8. Worries	.561**	.404**	.545**	.474**
Item 11. Friendly [1]	.325**	.444**	.265**	.437**
Item 13. Unhappy	.623**	.590**	.522**	.627**
Item 14. Liked [1]	.568**	.350**	.369**	.459**
Item 16. Nervous	.527**	.509**	.443**	.487**
Item 19. Bullied	.527**	.508**	.529**	.474**
Item 23. Adult company	.443**	.214*	.323**	.368**
Item 24. Fears	.494**	.491**	.483**	.530**
Externalizing				
Item 2. Restless	.606**	.326**	.515**	.501**
Item 5. Tempers	.504**	.440**	.409**	.564**
Item 7. Obedient [1]	.473**	.406**	.540**	.526**
Item 10. Fidgety	.615**	.353**	.521**	.512**
Item 12. Fights	.494**	.158**	.364**	.440**
Item 15. Distractable	.618**	.679**	.590**	.629**
Item 18. Lies	.434**	.450**	.451**	.466**
Item 21. Reflective [1]	.603**	.595**	.657**	.665**
Item 22. Steals	.198*	.181*	.203**	.291**
Item 25. Persistent [1]	.563**	.623**	.618**	.614**
Prosocial behavior				
Item 1. Considerate	.569**	.462**	.545**	.628**
Item 4. Shares	.489**	.416**	.426**	.448**
Item 9. Caring	.672**	.701**	.682**	.731**
Item 17. Helpful	.493**	.434**	.401**	.428**
Item 20. Kind	.592**	.734**	.636**	.694**

* $p < .05$. ** $p < .001$.

Note. [1] Reversed items.

Table 3

Standardized regression weights for the PANAS-X.

Subscale/Items	β	Range	*M* (*SD*)	|K|	|Sk|	α
Negative Affect						.80
Item 7. Irritable	.483*	1-5	1.92 (1.00)	.15	.95	
Item 12. Afraid	.614*	1-5	1.78 (.95)	.32	1.03	
Item 16. Upset	.550*	1-5	1.76 (.84)	.59	.96	
Item 21. Guilty	.602*	1-5	1.39 (.73)	3.75	2.01	
Item 23. Nervous	.632*	1-5	2.00 (1.02)	-.26	.76	
Item 26. Hostile	.449*	1-5	1.32 (.69)	5.60	2.37	
Item 28. Jittery	.339*	1-5	2.13 (1.19)	-.38	.79	
Item 30. Ashamed	.439*	1-5	2.07 (1.02)	-.27	.68	
Item 31. Scared	.666*	1-5	1.21 (.57)	7.90	2.06	
Item 34. Distressed	.669*	1-5	1.36 (.70)	5.98	2.30	
Positive Affect						.86
Item 3. Attentive	.564*	1-5	3.42 (.95)	.068	-.30	
Item 5. Strong	.574*	1-5	3.30 (.94)	.11	-.43	
Item 9. Inspired	.591*	1-5	3.11 (1.06)	-.33	-.34	
Item 15. Alert	.319*	1-5	2.66 (1.18)	-.88	.08	
Item 20. Active	.556*	1-5	3.82 (.89)	.41	-.60	
Item 25. Excited	.648*	1-5	3.26 (1.02)	-.09	-.48	
Item 27. Proud	.540*	1-5	3.07 (1.10)	-.55	-.27	
Item 32. Enthusiastic	.769*	1-5	3.56 (.91)	.38	-.57	
Item 35. Determined	.798*	1-5	3.49 (.10)	-.17	-.40	
Item 36. Interested	.747*	1-5	3.69 (.93)	-.07	-.46	

* $p < .001$.

Table 4

Standardized regression weights separately for gender and age groups for the 2-factor model for the PANAS-X.

	Gender		Age groups	
	Boys	Girls	6-10yrs	11-18yrs
Subscale/Items	β	β	β	β
Negative Affect				
Item 7. Irritable	.499*	.388*	.515*	.661*
Item 12. Afraid	.561*	.559*	.568*	.583*
Item 16. Upset	.624*	.436*	.483*	.675*
Item 21. Guilty	.586*	.517*	.483*	.642*
Item 23. Nervous	.656*	.563*	.616*	.452*
Item 26. Hostile	.440*	.390*	.444*	.420*
Item 28. Jittery	.358*	.318*	.250*	.460*
Item 30. Ashamed	.401*	.466*	.432*	.697*
Item 31. Scared	.632*	.632*	.637*	.721*
Item 34. Distressed	.613*	.732*	.580*	.461*
Positive Affect				
Item 3. Attentive	.537*	.524*	.521*	.353*
Item 5. Strong	.519*	.569*	.556*	.576*
Item 9. Inspired	.650*	.595*	.534*	.651*
Item 15. Alert	.344*	.380*	.292*	.541*
Item 20. Active	.529*	.616*	.486*	.589*
Item 25. Excited	.711*	.676*	.619*	.778*
Item 27. Proud	.615*	.561*	.523*	.828*
Item 32. Enthusiastic	.768*	.782*	.735*	.767*
Item 35. Determined	.784*	.747*	.777*	.605*
Item 36. Interested	.722*	.732*	.711*	.621*

* $p < .001$.